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FEDERAL COMMUNICATIONS COMMISSION
OFFICE OF THE SECRETARY

Secretary
Federal Communications Commission
1919 M Street, N.W.
Washington, D.C. 20554

Dear Sir:

I enclose an original and four copies of a Petition for Rule Making submitted by the American Digital Radio Society. Would you please accept this petition for filing.

Yours truly,

Warren J. Sinsheimer

Enclosures

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JUN - 1 1993
FEDERAL COMMUNICATIONS COMMISSION
OFFICE OF THE SECRETARY

Before the

Federal Communications Commission

Washington, D.C. 20554

In the Matter of Revision of Part 97 of the Rules Governing the Amateur Radio Services Concerning High-Frequency Data Communications	)))))	RM_____

To: The Commission:

PETITION FOR RULE MAKING

The American Digital Radio Society (the Society), a Delaware not-for-profit corporation whose members are all amateur radio operators licensed by the Commission, pursuant to Section 1.401 of the Commission's Rules, hereby respectfully requests that the Commission issue a Notice of Proposed Rule Making at an early date, looking toward changes in Part 97 of the Commission's Rules governing the Amateur Radio Services (47 C.F.R. Section 97.1 et seq.) in accordance with the attached Appendix, so as to clarify the current rules with respect to unattended semi-automatic control of RTTY and data communications in the high-frequency (HF) amateur bands, under certain conditions. The Society's goal in submitting this petition is to clarify existing

regulations; to encourage development of more efficient communications modes; to adapt digital technologies in the Amateur Radio Services for more efficient emergency and public service communications for rapid information transfer. As good cause for its petition, the Society states as follows:

1. Introduction

1. Digital communications in the high-frequency (HF) amateur bands have undergone drastic changes in recent years. Digital operation in the HF bands includes RTTY, a non-error protected simplex mode, usually using the Baudot code; AMTOR, a partially error-protected mode using the Baudot code; and Packet Radio (Packet), an error-protected half-duplex mode using the ASCII code. In addition, the Amateur community is presently using a new DSP-based system called CLOVER which is an error-protected, half-duplex highly spectrum efficient mode, and is experimenting with PACTOR, an error-protected half-duplex mode.

2. The newer technologies such as PACTOR and CLOVER promise significant improvement under the difficult conditions in the HF bands. The current rules do not appear to have contemplated the development of these new modes and a modest rule change is required to encourage these and other modes as they become available. In order to allow the Amateur Radio Service the technological flexibility it

requires to develop and adapt new technologies to practical use, the rules require minor alteration.

3. As currently used all of the above modes require approximately 500 to 1000 Hz. of bandwidth per channel compared with packet which requires a minimum of 1500-2500 Hz. per channel. Effective use of that bandwidth in terms of character throughput varies considerably as a function of the protocol used and the channel conditions. Partly because of the requirement for 1500-2500 Hz. of space per channel and partly because of the nature of the AX.25 protocol, the performance figures for Packet are the poorest per unit of bandwidth of any of the currently used modes. RTTY and AMTOR are better, and PACTOR is better still. CLOVER promises to exceed the throughput per unit of bandwidth of any of the above modes. Tolerance to poor channel conditions, especially multipath distortion, also varies among the modes with Packet having the poorest performance, RTTY next, AMTOR and PACTOR being next and CLOVER being very much better.

II. Background

4. On February 1, 1993 the American Radio Relay League, Inc. (ARRL) filed a petition for a rule making with the Commission which requested inter alia an amendment to Sections 97.109(d)(e) which would permit fully automatic digital operation in specifically designated sub-bands.

The Society has filed Comments and Supplemental

Comments with respect to the ARRL petition with the Commission. The contents of the Comments and Supplemental Comments are incorporated by reference herein.

It would serve no purpose for the Society to repeat the factual background of this matter. The same has been fully and accurately set forth in the ARRL petition, and is incorporated by reference herein.

5. It is no secret that available space is very limited in the HF spectrum. Nowhere is that more evident than in the very popular 20 and 40 meter bands. The two oldest modes of operation, voice and CW, use the lion's share of the spectrum in those bands since they were in heavy use before there were any digital modes. The digital modes have simply "squeezed in the cracks" between already established modes of operation. Since the digital modes have become established they have expanded gradually, a little at a time, primarily into space occupied by CW operation. Frequencies near the edges of digital mode operation continue to be shared by both digital and non-digital modes. Outside of the U.S., depending on the IARU region and the rules adopted by various administrations, digital operation for any given mode may not align with practice in this country, so it seems difficult to establish a sub-band plan that could be universally acceptable. It is simply inevitable that any band segment in the HF spectrum is going to be shared among

differing modes of operation. This is not a new condition on the HF bands and has been accommodated for decades.

6. Since all current HF band space is actively occupied by one or another mode of operation and since no current class of user should be required to give up space for another, gradual changes will continue to occur and these changes will be due to natural migration as a larger percentage of amateurs shift to digital from other modes of operation and from one digital mode to another.

7. Except in a very few special situations it has long been the tradition (and rule) that one amateur station must not willingly or knowingly interfere with a contact already in progress regardless of the mode of operation or the perceived importance of the communications in progress. It has also been a long standing tradition (and rule) that no station or group of stations "own" a frequency. (Frequency "ownership" has unfortunately become a practice on certain VHF frequencies, but this practice has never been established on the HF bands.) On HF the use of voluntary sub-bands with various classes of operation gravitating to specific locations is largely self-regulating simply by virtue of the fact that a station occupying a frequency is not driven off the frequency by deliberate interference by a station operating another mode. (There are always isolated exceptions to this but it is not condoned in the rules or by

the vast majority of amateur operators.) As greater numbers of amateurs use a particular mode that part of the band becomes recognized informally as a mode-specific sub-band. There is always a significant overlap in the sub-bands between modes - Packet sharing with RTTY, RTTY sharing with AMTOR, AMTOR sharing with CW, and so on. The greatest conflicts come where the overlapping modes have significantly different bandwidth, i.e., AM vs. SSB, Packet vs. RTTY.

III Automatic Digital Operation

8. Two types of automatic digital operation are possible for use on the amateur HF bands. One is fully-automatic operation where messages are passed between amateur stations without any operator intervention and no operator necessarily present at either station. The other is semi-automatic operation where messages are passed between amateur stations with an operator initiating the contact from one of the two stations. It is clear that both fully and semi-automatic operation is permissible under the rules provided there is a control operator present at both stations. (Stations authorized under the STA may operate unattended.) It is not clear, however, that, under the current rules, one station in such an operation may be unattended. For example, do the rules permit an attended RTTY station to call an unattended station to retrieve personal messages from it. Telephone calls to members of the

FCC staff indicate that these staff members believe that current rules do permit such operations. Digital operation in an unattended semi-automatic mode has long been a practice dating back to the 1960's. When the term "unattended semi-automatic" operation is used herein, it means operations which are initiated by a station with a control operator present to a station where a control operator is not necessarily present.

9. There are many reasons why unattended semi-automatic digital operation is desirable. It permits amateurs to exchange communications when there is a time difference between the operating times available to the two amateurs, and it permits the quick exchange of messages rather than taking air time with long calls and keyboard-to-keyboard operation. (This is not a suggestion by the petitioners that keyboard-to-keyboard is undesirable but simply that there are many cases where moving messages at machine speeds is more spectrum efficient and makes more frequency time available to direct keyboard operation.) It is evident that some form of automatic operation is desirable when handling NTS and personal messages between amateurs through intermediate stations. This capability forms the very heart of the amateur community's preparedness for emergency service. The petitioners believe that the potential for interference using a semi-automatic unattended

mode is much less than in a fully automatic mode. They do not believe that there is a greater potential for interference than there is in fully manual modes. As long as there is a control operator present at one end of the link, monitoring the progress of an exchange, such interference will be held to a minimum. The benefits of unattended semi-automatic operation outweigh the small risk of inadvertent interference. The petitioners believe that in view of the long successful history of semi-automatic operation that authorizing unattended semi-automatic operation (if, indeed the same is not currently permitted by the rules) is in the best interests of the amateur community and will further the telecommunications technology.

10. The proposal of the ARRL to authorize fully-automatic unattended operation represents departure from past practices. A clear majority of the respondents to the ARRL survey, as well as the recommendations of the ARRL's Digital Committee's report of June 1992, opposed any fully-automatic unattended operation on the amateur HF bands. This report recommended that the rules should be changed to allow unattended semi-automatic operation of digital stations on any frequency on which digital modes are authorized. This petition incorporates much of the digital committee's report, which was attached as an appendix to the Society's comments to the ARRL petition. To authorize fully-automatic

operation without restriction would seriously undermine the fiber of mutual cooperation that HF operation requires. A new digital committee of the ARRL repeated this recommendation, with some modification with respect to bandwidth in May 1993. The petitioners, however, do not reject such operations. They believe that it might be possible to ameliorate some of the problems inherent in fully automatic unattended operation if fully-automatic unattended operation were only permitted with respect to specific frequencies as suggested by the ARRL. If such automatic sub-bands were established, all of the users of those bands would be on notice that their communications were likely to be interrupted by such automatic operation. While this result may not be desirable from the point of view of non-automatic operators, the use of specifically allocated sub-bands would put such non-automatic operators on notice that they should not use these frequencies for "normal" communications. It should be recognized that the only mode of operation that is currently used for fully-automatic authorization is Packet, based on the AX.25 protocol, using 2 kHz. channel spacing. This mode (Packet) delivers the poorest performance with respect to spectrum utilization or survivability under adverse propagation conditions of any the digital modes currently in use.

11. The proposal for the use of sub-bands for

automatic operation does not eliminate the problem of interference between incompatible modes, it just moves the problem to within the sub-band. This "incompatibility" is merely the result of the inadequacy of the technology in preventing transmission while the frequency is being used by someone using a different mode. The ARRL petition correctly points out the difficulties relative to HF operation generally.

> "First, amateur HF allocations are heavily occupied by amateur stations using various modes of operation. Second, there is a continuum of change in HF propagation. Changes in propagation paths and signal strengths can and often do occur so suddenly that an ongoing communication between two stations (in any mode) may be neither causing nor receiving interference one minute; but the next minute, due to propagation shifts, harmful, even preclusive interference can appear to or from another communication on the same or adjacent frequencies. Third, there is no "channelization" in the HF amateur bands (as indeed there should not be, for reasons not necessary to explore herein). Because the subbands for automatically controlled data stations proposed in RM-7248 included segments in which certain operations were already firmly established, and given the above factors, it is understandable that some amateurs were concerned about the disruption of existing communications that would result from the RM-7248 plan."[1]

To alleviate this problem, the Society proposes that any amateur station authorized to use data communications on HF frequencies should be allowed under the rules to operate under unattended semi-automatic control while transmitting data communications on any frequency

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[1] ARRL Petition ¶18

authorized for digital communications, provided that such operation does not cause interference to preexisting, regular communications. Fully automatic operation should either be prohibited on the HF Bands or confined to specific sub-bands as suggested by the ARRL.

12. The crowded conditions and the inability of a fully automatically controlled station to "listen" prior to transmitting to prevent interference, dictate some element of control be present during automatic type operation. By requiring that a control operator be present at one of the two stations involved in the communication, messages may be passed between amateur stations without any operator intervention provided an operator is present at one of the stations to ascertain that interference is not occurring and to initiate the message passing process and to terminate the connection if necessary to comply with the rules and regulations. Otherwise, random automatic control of data stations at HF would undermine the degree of cooperation in interference avoidance that HF operation, by its nature, has always required.

13. The ARRL petition admits that because of the HF some essentially immutable principles of HF operation contained in the Commission's rules that bear on the concept of automatically controlled HF data communications.[2] The

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[2] ID., ¶20

ARRL petition goes on to admit that the operating principles of the Commission with respect to willful and malicious interference and the principle that no station has a greater right than any other to the use of a frequency are:

> "somewhat at odds with the concept of automatic control of data station at HF because of such operation, by its nature, is mode-specific and automatically controlled stations will not necessarily be able to determine whether the frequency on which they transmit are accepted by a station using another mode at the time they commence a transmission."[3]

14. Notwithstanding all of the above there remain good and sufficient reasons why some form of automatically controlled data communications at HF should be authorized under certain conditions. Semi-automatically controlled HF operation is absolutely essential to the handling of National Traffic System emergency and public service messages between amateurs through intermediate stations. HF data communications have provided a marvelous means of rapid data transfer in emergency communications, and the ability to do so over long distances rapidly requires the use of semi-automatically controlled HF stations to move the data through the system, between and among locally controlled stations. The infrastructure for this system, to move this traffic, must be operational in advance of any emergency, when the

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[3] Ibid.

need for its use becomes acute. In addition, such operation permits amateurs nationwide and worldwide to exchange communications when there is a time difference between the operating times available. It permits the quick relay and exchange of reliably transmitted messages, avoiding the delay inherent in coordinating operator schedules in keyboard-to-keyboard operation. Further, it permits management of peak load requirements in the crowded HF bands by shifting semi-automatic message forwarding to times of day when fewer operators of other modes are active. Moving messages at machine speeds, without the delays and interruptions in relaying messages caused by the unavailability of network link stations (due to the vagaries of operator schedules), is far more spectrum efficient and makes more frequency time available for other types of communications, including direct keyboard-to-keyboard communications.

IV. A Regulatory Approach for Automatically Controlled Data Communications

15. Because some automatically controlled HF data operation is necessary and desirable; because it is more difficult at HF frequencies than at VHF and above, in terms of interference avoidance, to have two or more automatically controlled stations communicating with each other without a control operator present at either end of the communication, the petitioners recommend the following:

Consistent with the frequency privileges and other operating limitations applicable to the license class of the operator, the rules should be amended to allow unattended semi-automatic operation of digital stations. Unattended semi-automatic stations may not initiate a contact, either with another station or via an undirected broadcast. An operator initiating a contact with an unattended station must first ascertain that no interference will be caused to existing communications, and must monitor the progress of communications. If it becomes evident that the communications with an unattended semi-automatic station is interfering with other amateur communications then the link with the automatic station must be discontinued. An unattended semi-automatic station must be equipped with a means to insure that no signal is transmitted longer than five minutes in the event of the malfunction of control equipment or the loss of contact with the initiating station.

16. To encourage improvements in digital mode communications and to improve spectrum utilization, the petitioners also recommend the following:

The rules should be amended to allow the use of unspecified digital codes for the purpose of efficient data compression and error control on HF. The bandwidth (as defined in Subpart A, 97.3(8)) of such signals should be restricted to 500 Hz. below 28 mHz. and 2000 Hz. between 28.0

and 28.3 MHz.

V. Enforcement Issues

17. In addition to concerns about interference prevention, a few of the respondents to the ARRL survey were concerned with possible abuses, or unlawful use of the data networks. They asked whether automatically controlled HF data operation would contribute to such a problem, or at least make enforcement difficult. The concern about abuses related principally to third-party traffic communications. The ARRL Digital Committee reported that it was not aware of any pattern of such abuse, nor did it see any reason why unlawful operation is any more likely while a station is under automatic control than when two stations are operating under local control. Current rules as to a licensee's obligation to assure proper control are sufficient to inhibit any unlawful operation.

VI. Conclusion

18. It is apparent that the amateur community favors the use of automatically controlled data stations on HF only under certain circumstances. The development and adaptation of new, efficient data technologies have been facilitated by the use of semi-automatically controlled stations, which more than justifies the continued authorization of such and the extension of that authorization to include unattended semi-automatic operation as herein

defined. There is no need to restrict semi-automatic operation in order to avoid interference to other users in the event that the Commission determines that the Rules do not already permit such operation. The only restriction required is that a control operator be present at one end of the communication or the other to monitor for interference and terminate the communication if interference is present. While this proposal will not prevent all interference, it will insure, to the extent practicable, that interference is minimized.

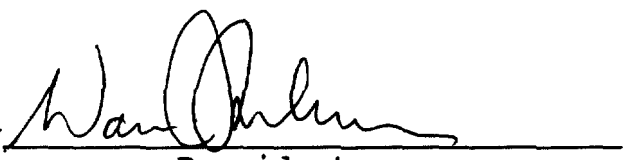
19. There are no significant enforcement problems associated with operation under this arrangement, and it is unnecessary to either restrict the modes of data communications which can be used at HF and MF under unattended semi-automatic control or to restrict this operation to sub-bands. Nor is it necessary to preclude third-party communications, which are conducted during emergencies and in public service communications contexts. International third- party traffic rules would apply as they do to other types of amateur communications.

Therefore, the foregoing considered, the American Digital Radio Society, Incorporated respectfully requests that the Commission issue a Notice of Proposed Rule Making at an early date looking toward the authorization of unattended semi-automatically controlled HF data communications as per

the attached Appendix.

Respectfully submitted,

The American Digital Radio Society

By 
President

APPENDIX

1. Sections 97.109(d) and (e) are amended to read as follows:

Section 97.109 Station Control.

(d) When a station is being automatically controlled, the control operator need not be at the control point. Only stations transmitting RTTY or data emissions, and stations specifically designated elsewhere in this Part, may be automatically controlled. Automatic control must cease upon notification by an EIC that the station is transmitting improperly or causing harmful interference to other stations. Automatic control must not be resumed without prior approval of the EIC. RTTY and data stations operating under automatic control on frequencies below 50 MHz must incorporate provisions for discontinuing transmitter operation in the event of malfunction, or interruption of communications with another station and are subject to the following additional restriction:

(1) An operator initiating a contact with an automatically controlled station below must first ascertain that no interference will be caused to existing communications, must monitor the progress of communications and if it becomes evident that the communications in progress are interfering with other amateur communications, then the link with the automatic station must be discontinued.

(e) Stations authorized by these rules to transmit RTTY or data communications under automatic control may transmit third party communications. Any retransmitted messages on behalf of any third party must originate at a station that is under local or remote control.

2. Sections 97.307(0(3) and (4) are amended to read as follows:

(3) A RTTY or data emission using a specified code listed in 97.309(a) of this Part may be transmitted. The symbol rate must not exceed 300 baud, and for frequency-shift keying, the frequency shift between mark and space must not exceed 300 Hz. A RTTY or data emission using an unspecified digital code under the limitations listed in 97.309(b) of this Part also may be transmitted. If an unspecified digital code is transmitted the authorized bandwidth is 500 Hz.

(4) A RTTY or data emission using a specified code

listed in 97.309(a) of this Part may be transmitted. The symbol rate must not exceed 1200 baud, and for frequency-shift keying, the frequency shift between mark and space must not exceed 1 KHz. A RTTY or data emission using an unspecified digital code under the limitations listed in 97.309(b) of this Part also may be transmitted. If an unspecified digital code is transmitted the authorized bandwidth is 2 KHz.